PLAGUE.

Being a translation of the Fourth Chapter of "La Pathologie Exotique," by Professor A. Le Dantec of the Faculty of Medicine, Bordeaux.

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(Concluded from page 283)

The carbuncles (Les charbons) are thus named because of their resemblance to a malignant pustule. The primary carbuncles begin with a red spot resembling the bite of a flea. The center of the spot raises itself as a vesicle and becomes filled with a reddish fluid which distends and enlarges it more or less. After the rupture of the primary vesicle comes a central placque or sphacelus, about which forms new daughter vesicles. In fact, outside and about the daughter vesicles the skin presents a red color: sphacelating point, daughter or secondary vesicles and inflammatory zone spread themselves upon the surface.

The secondary carbuncles are more spreading than the primary carbuncles. They have been known to denude an entire member. Clot-Bey has divided the carbuncles into three degrees:

First degree. Superficial lesion involving on the epidermis.

Second degree, or anthrax. Lesion involving the skin and subcutaneous cellular tissue.

Third degree. Gangrene of the skin, muscles and bone.

The carbuncles appear usually on the trunk and limbs, but one may observe them in all the regions of the body, the scrotum, the labia, the nose, the scalp, etc., with the exception of the palms of the hands and the soles of the feet. Their number may vary from one to twelve. The carbuncles leave behind them indelible cicatrices.

The petechiae, when they appear in plague constitute a sign of the greatest gravity and generally announce a fatal termination. Sometimes punctiform, the petechiae are about the diameter of a lentil. At other times, however, they may be so large as to merit the name ecchymoses. The petechiae may appear upon the neck, the chest or the limbs, but occasionally they are so numerous that the skin is discolored as if it had been beaten, from which the name, black plague is given this form. (Mertens.)

As the petechiae are, on the whole, an infiltration of blood into the skin, they are generally accompanied with grave hemorrhages in other ways, epistaxis, hematemesis, etc. This variety of plague is also called hemorrhagic plague.

Sphacelus of the extremities is a rare complication of plague. Its mechanism is the same as in other grave pyrexias.

One also observes, as in other infectious diseases, secondary foci of suppuration, furuncles, boils, suppurating arthritis, etc.

The kidneys are also attacked by plague and produce albumen in the urine.

Various psychical troubles may manifest themselves during the course or during the convalescence of plague. In the beginning of the disease one observes a considerable hebetude, the patient understands with difficulty what is said to him. He responds badly, sometimes harshly or incoherently, like a drunken man. Later the stupor is augmented with delirium and hallucinations. Finally the patient sinks into coma and dies without having recovered his intelligence for a single instant before the fatal termination. One observes sometimes psychoses during the convalescence from plague. These are called post-plague amnesias and aphasias. True dementia is very rare. Premature abortion or labor is the rule in pregnant women attacked by plague.

Observation II. (Simond). Chinese, age 46 years. The subject, of large and strong stature, lives in a quarter outside the city. He has been sick three days. In the anterior cervical region an adenitis has developed to the point of completely effacing the depression of the neck. The enlarged glands form a solitary mass of very hard, almost woody consistence, painful on pressure, over which the skin is tender, red and congested. The face is flushed, there is intense dyspnea and noisy respiration has been produced by the compression of the trachea by the adenitis. The entire buccal mucous membrane is inflamed, red and bloody. The tongue is covered by a brownish coating and is cracked and swollen.

The axillary temperature is 40°. The pulse is small and 132 per minute. The skin is parched and hot, and does not present any exanthem except that it is red about the buboes. The spleen and liver are apparently normal. The abdomen is slightly swollen. There has been constipation for four days and the urine is scanty. The patient has been in a very weak state for two days. He has presented delirium but at the moment when I examined him he knew what was said to him and responded by signs. The condition of the mouth and the difficulty of respiration did not permit him to speak intelligently. Death supervened twenty-four hours later.

Observation III. (Simond.) Annamite; 24 years old. The patient complains of continuous fever, lassitude and cephalalgia since the 9th of April. He has had some vomiting and was confined to his bed on the 11th. I was called to see him on the night of the 13th. At that time the patient was lying in a state of marked prostration with an intense fever. The axillary temperature was 40.5°. The pulse was 120. The tongue was coated and moist, and he spoke with difficulty. On the right thigh below the fold of the groin is a large tumor formed by two swollen very painful glands. The skin covering it is tender and slightly congested. The spleen and the liver are of normal dimensions but indolent. There has been constipation for several days. The urine is normal in quantity and contains a small amount of albumen. The weakness has been very great for two days, the patient falling upon attempting to go from his bed to a chair and being unable to arise.

During the four days which followed conditions remained unchanged: the temperature oscillated between 39.5° and 40.5°. There was delirium during the night and part of the day. The treatment followed consisted of quinine with cinnamon and ether and purgative injections. On the 18th defervescence began, the pulse fell to 60 and the temperature to 38.5°. The primary swelling diminished in size but the entire lymphatic chain of the groin was swollen and indurated. The improvement continued during the following days. However, one of the two glands first invaded became softened and suppurated. I saw the patient again eight days later completely recovered.

(c) Ambulatory, or attenuated form. This form is characterized by painless buboes accompanied by little or no fever, terminating sometimes in resolution or suppuration. The patient is able to walk about during his illness. Generally one encounters grave forms of plague near these attenuated forms. There are recorded veritable epidemics of attenuated form of plague, for example, the epidemic of benign plague which took place, according to Rossi, in the third regiment of the line at Zagazig (Lower Egypt) in 1842. This is the endemic of Bagdad from 1856 to 1861. Such are the epidemics of attenuated plague which preceded the epidemics of grave plague in India in 1873 (Irak-Arabi), in Astrakan in 1877-1878. At LaReunion Thiroux demonstrated that many of the primary buboes were simply of attenuated plague.

2. Pulmonary Plague or Primary Plague Pneumonia.

Certain epidemics of plague are characterized by great frequency of the pulmonary forms and for a

long time there was great hesitancy in calling these epidemics of true plague. This was the case of the epidemic of Pali. The pulmonary form of plague was frequent in the epidemics of Korassan and Kurdistan. At other times epidemics of plague began as the pulmonary form as at Vetlianka. These were thought in the beginning to be cases of croupous pneumonia. The pulmonary form of plague is characterized by great dyspnoea, blood streaked sputum and by the clinical signs of pulmonary hepatization. It is thus a pest pneumonia. The mortality is extremely high. The disease described by Renny under the name of Mahâmurrie of Guhrival was nothing else but an epidemic of the pulmonary form.

Here is the observation of Mauser, who died of pneumonic plague in India:

Mauser was well until the second of January, when, in the forenoon he was seized with a chill and fever. During the remainder of the day he suffered from a violent headache and nausea with vomiting, generalized pain and cough. The temperature mounted to 39.7, the pulse to 116, the tongue remained clean and moist, the skin normal. That night he was very ill. The third of January he was worse, temperature 40°, pulse 110, respiration 23. In the afternoon he complained of pain in the lower part of the left axilla without engorged or sensitive glands.

The night of the third and fourth he was exceedingly ill, temperature 40.3°, pulse 114, respiration 25. The tongue was moist, with slight coating posteriorly. The patient began to cough and to raise a sero-mucous sputum, streaked red by blood. The axillary pain persisted and ausculation at this level disclosed fine crepitant rales which resembled those found at the beginning of a pneumonia. These rales were deeply seated below the left clavicle. The remainder of the lung and the other organs seemed to be normal.

Still the symptomology is not that of an ordinary pneumonia. There is not the respiratory acceleration, the dyspnea; the sputum is not adherent; it is more watery, serous rather than mucous; it is stained slightly red. There is more depression than would be expected at such an early date from so small a focus. For this reason Childe made microscopical examination of the sputum and found large numbers of bacilli having the aspect of pest bacilli. The culture developed almost pure colonies of plague.

The 4th and 5th the patient became worse and worse. The expectoration was abundant, the temperature 40°, respiration increased from 35 to 45 and the pulse from 120 to 135. The tongue became dry. The patient died on the 6th in the fifth day of the disease. The nurse who cared for this patient died of the same form in less than four days. (Childe & Netter.)

The cases of plague which are produced in laboratory epidemics are also cases of pneumonic plague. Barisch, the laboratory boy of Vienna, had pneumonic plague. He was attended by Dr. Muller, who also had the pneumonic form and died in less than three days.

The manufactories of rags also give birth to the pneumonic form of plague, as in the recent epidemic of St. Barnaby near Marseilles.

We would especially call the attention of physicians to the importance of the bacteriological examination of the sputum, which alone will clear up all doubt in these cases.

3. **Gastro-Intestinal Plague.** The existence of gastro-intestinal plague is admitted by only a small number of authors. Hojel reported five observations. Wilm recovered the pest bacillus from the fecal matter of plague patients and has seen one case with a mesenteric bubo.

Gastro-intestinal plague is characterized by evacuations, at first bilious, later hemorrhagic. The patient presents melena and true hematemesis exactly like black vomit. The epidemic of Recht in 1877 was remarkable because of the great number of gastro-intestinal cases.

One thus sees that it is necessary to know the existence of the clinical forms of plague in order not to commit a fatal blunder, especially at the beginning of an epidemic, when prophylactic measures may be taken to arrest the scourge.

Pathological Anatomy.

The anatomical lesions which one encounters at the autopsy of subjects dead of plague vary according to whether the form be bubonic, septicemic or pneumonic.

1. Bubonic form. The pathognomonic lesion of plague is the bubo, which may be external, bubo of the groin, the neck or axilla; or internal, bronchial glands, or glands of the pelvis. The pest bubo is an adenitis accompanied by hemorrhage and bloody exudation, sometimes by suppuration. The cellular tissue which surrounds the gland is infiltrated with a sanguinolent serum. Sometimes on opening the gland, one finds it the color of lees of wine, just before suppuration takes place. The bacilli of plague first invade the crypt of the gland and finally the folliculi of the same. In the period of suppuration purulent tracts are formed which connect the internal glands with the external glands, glands of the axilla with the bronchial glands, glands of the groin with glands of the pelvis.

2. Septicemic form. When death takes place very rapidly one finds the lesions common to all of the septicemias.

The body is usually covered with petechiae and ecchymoses. In certain cases they are so numerous as to give the skin a blackish appearance, which has caused the name "black pest" to be attached to this form. One may observe here as in cholera spontaneous post-mortem movements, with a coincident rise of temperature. The ecchymotic placques which are called internal pustules are found on all the serous surfaces, pleura, pericardium and peritoneum. The heart contains fluid blood slightly coagulable. The lungs are deeply congested, sometimes accompanied with pneumonia, broncho-pneumonia, infarcts and abscesses of the same. The spleen is considerably increased in volume. The liver is hyperemic. The mucous membrane of the digestive tube presents here and there ecchymotic spots and ulcerations, principally in the neighborhood of the ileo-cecal valve. The small intestine sometimes contains extravasated blood. The uterus and the bladder present sub-mucous ecchymoses. The brain is deeply congested and on incision presents more or less abundant punctate hemorrhages.

In the place of the hemorrhagic septicemia which we have just described, one sometimes finds, at autopsy, the lesions of a septicemic pyemia, with metastatic foci in all the viscera, lungs, spleen and kidneys. The purulent foci are filled with the bacilli.

3. Pneumonic form. The third type is the primary plague pneumonia with rapid fatality; the glands have not had time to become altered. This acts as a confluent lobular broncho-pneumonia, with involvement of the pleura. The tonsils are often red and enlarged.

Diagnosis.

The diagnosis between plague and the other typhoid diseases, typhoid fever and typhus, does not offer any difficulty for these maladies have one symptom in common, that is, stupor. The characteristic bubo of the common form of plague is a substantial basis for the diagnosis. It is not often in the septicemic, pulmonary and gastro-intestinal forms that the diagnosis can be made without hesitation in the beginning. It is useful in these cases to search for the pest bacilli in the blood and excreta.

Bareskoff has described under the name of Si-

berian plague (Sibirskajajasna) an infectious disease caused by the bites of insects and characterized by the presence of carbuncles and pustules on the surface of the skin. It attacks animals severely, men less severely.

Prognosis.

The primary pneumonic form and the septicemic or typhoid form are almost always fatal. The grave bubonic form is announced by a succession of symptoms very disquieting from the first, temperature as high as 40°, repeated bilious vomiting, facies drawn, profound stupor, coma, violent delirium, purpura, considerable oedema in the region of the affected gland, etc.

The benign bubonic form is marked on the contrary by an attenuation of the symptoms both local and general, but in the presence of a case of this class one should reserve the prognosis, for death has been observed to follow a plague bronchopneumonia in patients who were apparently out of danger. Plague is almost always fatal in children and in the aged.

Mortality.

We have previously established that all races present more or less the same receptivity for plague, but we will see now that once the disease has been contracted, all do not offer the same resistance to the virus. According to Simond, the resistance is manifestly greatest in Europeans. Thus, in India, their mortality was between 38% to 39%, while that of the Mohemmedans was 70% and that of the natives was always above 80%, reaching over 90% in the lower castes. The mortality of the hybrids was between that of the Europeans and the Musselmans. Good health and good food increase the individual resistance of all the human races.

Prophylaxis.

The prophylaxis of plague, like the prophylaxis against cholera, requires three successive lines of defense. 1. International prophylaxis, which comprehends the measures adopted by the league of Europe against the invasion of pestilential diseases. 2. National prophylaxis, which comprehends all the measures taken by the French government against the importation of plague into its proper territory. 3. Finally, interior prophylaxis or public hygiene, charged with combating the plague once it has disembarked and reached the interior territory. This triple line of defence may be compared to the triple line of defences about a besieged city; first, the exterior line of forts represents the international prophylaxis; second, the ramparts represent national prophylaxis; and third, the barricades of the streets represent the measures taken for the public hygiene. It is the latter which we will study in this chapter, the two former relating to the international and national sanitary police, which is considered at the end of this volume.

The prophylaxis against plague on land comprehends:

1. Measures to be taken to prevent plague.
2. Measures to be taken in the presence of a case of plague.
3. Measures to be taken in the presence of an epidemic of plague.

Measures to be Taken to Prevent Plague. War Against the Rats. The rat being the specific vehicle, as one might say, the commercial traveler of plague, if one would wipe out that animal, one would cut off at the same time all chance of the propagation of plague throughout the world. From this is born the idea of declaring war of extermination against rats. It is the great question of to-day.

In the first place, from a historical point of view, it is well known that the rat is not an autochthonous animal; it has come from Asia by two successive emigrations. The first emigration was that of the black rat, having a tail longer than the body, which dates somewhat prior to the fall of the Roman Empire. The second emigration was that of the brown rat, having a short tail and a large body, which invaded all Europe at the commencement of the 18th century. The brown rat, being more hardy, hunted the black rat almost to complete extermination, until it was obliged to seek refuge in the fields. Thus the brown rat actually reigns as master in the cities, where he inhabits the drains, the cellars, the sewers, etc. The havoc caused by rats is estimated at many millions per year.

The idea of declaring a war of extermination against these rodents began in Denmark, where Zuschlag has been a veritable promoter and apostle of this new crusade. Zuschlag associated others with him as a committee and was charged with the collection of the necessary funds for this campaign in a new field. The committee offered a bounty of fourteen centimes for each rat tail which was brought to them. In a few months one hundred thousand rats were exterminated. In 1901 the committee organized at Copenhagen an international exposition of the apparatus for the destruction and capture of rats. The anti-rodent movement spread to the rest of Europe, America and Australia. In France, Granjux has been the initiator of this movement. He reproduced in "Le Caducee" the designs of ingenious apparatus for the capture of rats and has published in that journal two articles on the question in hand. All the procedures employed for the destruction of rats reduce themselves to five systems:

(a) The system of poisonous preparations.
(b) The system of virus.
(c) The system of traps.
(d) The system of bounties.
(e) The system of gaseous asphyxiants.

(a) Toxic preparations. The various pastes called "death to the rat" have for their base arsenious acid, phosphorus or strychnine. All these preparations are inconvenient in that they kill the animal on the premises, where the cadavers produce an insupportable odor during the entire time of their putrefaction. The system of viruses presents the same inconvenience.

(b) Virus. In 1893, during an epidemic which appeared spontaneously in the field mice and squirrels in Seine-et-Marne, Danysz isolated a cocco-bacillus from the cadavers of these dead animals. As this cocco-bacillus, virulent for this species of vermin, was absolutely non-toxic for man and domestic animals, Danysz conceived the idea of using it for the systematic destruction of rats. The experiments made recently at Aigre, Oradour and Mons, on a surface of 1200 hectares, 95% of the rats were killed with the experimental epizootic. Following these conclusive experiments Parliament, by the law of March 24, 1904, placed at the credit of the Pasteur Institute 295,000 francs for the manufacture and shipment of sufficient quantity of Danysz virus to treat 150,000 hectares. This war of extermination was made necessary by the progressive invasion of the fields by field mice in Charentes, Calvados and Marne. The following is the procedure for the distribution of the virus: Little cubes of bread are soaked in the bouillon culture of the cocco-bacillus and placed in the opening of each rat burrow. In about 8 to 10 days a fatal epidemic appears among the rodents.

(c) Trapping rats. The system of capture of the rats in cages is to be recommended because it permits the examination of the bodies of the rats. This is the system employed by rat catchers.

(d) Bounties. The system of bounties has proven more efficacious because it includes all the different systems employed by professional rat-catchers for the capture of these animals. It has been adopted by the English in India and Hongkong, and also by us at Tonquin. At Hanoi the bounty was ten cents

per rat at the beginning but, on account of the fraud perpetrated by the natives of importing the rats from the frontiers of China, it was necessary to reduce the bounty to one cent. In the space of one month 640,000 rats were exterminated.

(e) Gaseous asphyxiants. The system of gaseous asphyxiants, carbon monoxide, carbonic acid and sulphurous acid are all to be employed in the destruction of rats on board ship. We will speak of it in the addendum under the maritime sanitary police.

2. Measures to be Taken in the Presence of a Case of Plague. When a suspicious case of plague is discovered, the physician is required to advise the local authorities and in co-operation with them to take a series of measures for the isolation of the patient and the destruction of the contagion. Here is the enumeration of these measures:

(a) Obligatory declaration. All cases suspicious of plague should be immediately declared, first to the mayor, second, to the sheriff or deputy sheriff.

(b) Telegram to the director of the Laboratory of the province. The physician should advise telegraphically the director of the bacteriological laboratory of the maritime province to which he belongs. Here are the cities in which there is an officially named director: first province, Lille; second, Rouen; third, Brest; fourth, Nantes; fifth, Bordeaux; sixth, Montpellier, Marseilles, Algiers, Oran, Constantino, Tunis.

(c) Isolation of the patient. The patient should be immediately isolated in another place in order to allow the disinfection of that which he has contaminated. If there exists an isolation hospital and ambulance, the patient should be immediately taken there and the vehicle which served for this purpose immediately washed with an antiseptic solution.

(d) Precautions to be taken in the sick room. Before the entry of the patient, the room should be freed of the curtains, the hangings, the carpets, and all the furniture which is not indispensable. The bed should be taken apart and washed with an antiseptic solution and placed in the middle of the room. The mattress, the sheets and bed-clothing should be placed in an oven to kill all living parasites. The floor should be washed with an antiseptic fluid, especially in the cracks and angles so as to kill the fleas and parasites. It should be washed with an antiseptic every day.

The patient should be kept in a state of constant cleanliness. The person nursing him should be subject to the following rules:

To be immunized by an injection of 10cc of Yersin's serum.

Not to take any food or drink in the patient's room.

Never to eat without having washed the face and hands with soap and a disinfectant solution, or without having rinsed the mouth with a hydrocnloric acid lemonade, 4 gm. to the 1000.

The room should be thoroughly aired several times daily.

The soiled linen should be immediately plunged in a vessel containing an antiseptic fluid.

(e) Disinfection of the infected room. The entire bedding, mattress, sheets and blankets, all the body linen and clothing of the patient, and the curtains of the room should be heated in an oven at 120° C. All articles which will not permit of fumigation with sulphur should be fumigated with formaldehyde or moist steam at the temperature of 70°.

For disinfecting the apartment, sulphur dioxide is the best means after having sealed all the cracks with strips of paper. Thirty to forty grams of sulphur to the cubic meter are necessary.

If sulphuration is not possible, the entire surface of the room, ceiling, walls and floor should be washed with a solution of corrosive sublimate, sublimate 1 gm., salt 2 gm., water, 1000.

It is important that the persons charged with the disinfection should wear special garments which are to be disinfected at the end of these operations.

3. Measures to be Taken in Case of an Epidemic of Plague. Epidemics of plague are no longer known in Europe, because the rigorous isolation of the first case, joined with the disinfection of the locality, arrest the disease immediately. But this is not the same in colonies where the European authorities are not warned until the epidemic has begun. In such a case it is necessary to take the following radical measures:

(a) Destruction by fire of all the contamined villages.

(b) Disinfection of all the clothing left at the disposition of the inhabitants.

(c) Transport of the infected population to another village especially constructed to prevent communication with the neighboring towns. Injection of prophylactic serum.

(d) Construction of an isolation compound for all plague patients.

(e) Destruction of the rats and mice in all the villages of the country.

Quarantine should not be raised until after the close of the epidemic. The patients should not be liberated until after another minute disinfection of their bodies (bath) and clothing (steam under pressure).

Treatment.

The treatment of plague includes preventive and curative treatment.

1. Preventive treatment. The preventive treatment is applied in the hope of protecting from plague persons who sojourn in plague countries. Two products have been used for this, Haffkine's lymph and Yersin's serum.

(a) Haffkine's lymph. We have seen in the chapter on bacteriology that Calmette, after experiments made upon animals gave a favorable opinion on the employment of Haffkine's preventive lymph. However, other experimenters working on the same animals have arrived at conclusions diametrically opposite. (Simond, Vassal.) This does not necessarily judge the method as applied to man, for the statistics published in India, where more than 400,000 vaccinations have been made, are very favorable. Also the English government has favored all taking the Haffkine's vaccination, by according to the vaccinated natives many advantages, such as freedom from quarantine, authorization to be treated at home, etc.

Haffkine's method is open to the following objections:

1. The method is not surely efficacious, for the vaccinated take plague, like the non-vaccinated, though in much smaller proportions, 1 vaccinated to 4 non-vaccinated.
2. Immunization is not acquired till the seventh day, a grave objection in time of epidemic.
3. The injection is very painful. It produces immediately a very active local reaction. The neighboring glands become swollen and the temperature sometimes reaches 39° to 40°. The inoculated patient is obliged to stay in bed for several days. In the presence of these results it is better to have recourse to serum vaccinations.

(b) Yersin's serum. This method has weighty advantages over the method of Haffkine.

1. The immunity acquired is immediate, an important thing in checking a beginning epidemic.
2. The injection is not painful, which makes it accepted more easily than that of Haffkine.
3. The immunity is certain during a minimum of ten days, as has been proved by all experiments made upon animals. The dose to be inoculated is 10cc. for an adult.

2. Curative treatment. The curative treatment

comprehends both the medical and specific treatment by serum.

The medical treatment is purely symptomatic. It consists in administering tonics and diffusable stimulants and cold baths whenever the axillary temperature is very high. If one does not have antipest serum, we advise the use of intra-venous injections of collargol, 2½cc. of a 1% solution.

The specific treatment consists in antipest serum therapy. Two antipest serums have been tried in the treatment of plague, the serum of Lustig and the serum of Yersin.

(a) Antitoxic serum of Lustig. We have seen in the chapter on bacteriology the way of making this serum. Galeotti and Polverini have tested its curative virtues for man in the epidemic of Bombay of 1898. The injection was made beneath the skin of a dose of 10 to 20cc. repeated twice the first day and continued on the following days. The total quantity of serum injected into an adult varied from 60 to 80 cc. The mortality in treated individuals in three series covering fifty-nine cases was one per cent.

The monograph of the two Italian authors has been thus summed up by Netter:

The treatment has greatest chance of success when it is commenced early in the disease. The authors have been able to cure three cases of septicemia because they began on the first day. They were never successful in curing the pneumonic form which they consider as absolutely fatal.

(b) Antitoxic and antimicrobic serum of Yersin. Here is an experiment made by Simond in India which proves the efficacy of the serum from a therapeutic viewpoint in the animal most closely approaching man:

"We diluted with 4 cc of sterile bouillon two drops of blood taken from the heart of a rat dead of spontaneous plague, the blood containing the bacilli in pure culture and in great abundance. Immediately afterward they injected this liquid into two large apes of the same species, size and weight. Each received an injection of 2 cc beneath the skin of the thigh. After about twelve hours the two animals presented large right inguinal buboes, intense fever, stupor, difficulty in walking and great feebleness. The symptoms were identical in all respects in both animals. Twelve hours later, that is to say, twenty-four hours after the inoculation, we injected 20 cc of serum into one taken at random. This one changed notably in his condition in the few hours which followed, and the day afterward he took a little food and seemed less depressed while the control was much worse. The latter died sixty-seven hours after inoculation. On the contrary, the ape treated with serum recovered. The fever of this one fell on the fourth day and suppuration of the bubo took place from the sixth to the tenth day."

At the beginning of the use of serum therapy in the treatment of human plague the injection was always made beneath the skin. Calmette and Salimbeni, at Oporto, used for the first time intravenous injections in the treatment of plague pneumonia, which prior to this time had always been considered fatal. Thanks to this energetic method they obtained three cures out of three cases treated. After this, the treatment by intravenous injections was employed in the bubonic form of plague. Vassal, at La Reunion, and Noc, in New Caledonia, made intravenous injections of 40 cc to 60 cc twice daily. The effect of these large doses was the checking of the disease. Vassal inoculated 20 cc in the veins and 40 cc or less beneath the skin the first day. He renewed this double injection 12 hours later if the case was grave. The total quantity of serum used in treating a single patient was as high in one case as 440 cc. In using intravenous injections, care should be taken to avoid the introduction of air in the veins. Here is the method of operation:

One chooses a syringe which will empty itself completely and a flask of clear serum. If the serum is clouded it should not be used until after filtration through antiseptic cotton. The serum should be heated to about 37°, the syringe filled and freed from any bubbles of air which it may contain. After having sterilized the selected region (fold of the groin, back of the hand or malleoar region) one applies at the base of the member a constricting bandage to cause the vein which is to be injected to fill with blood. One lifts the skin with the left hand and with the right forces the point of the needle of the syringe into the vein. The blood flowing out drop by drop shows that one is well within the vessel. One then fits the beak of the charged syringe upon the free end of the needle and makes the injection slowly. In four or five minutes one may release the bandage slightly. To be sure that one has not injected a bubble of air one does not empty the syringe entirely. The needle is removed and a little collodion applied.

The hypodermic injection is made in the right or left flank. One has no advantage over the other except as it be near the glands.

The results obtained are very variable. This variability is dependent on many factors, the antitoxic power of the serum, racial peculiarities and early or late intervention. Yersin, in his first trials in China, had magnificent results in antipest serum therapy. Twenty-one cures out of twenty-two cases. Later, in India, the statistics were less favorable, the mortality being 49%. At La Reunion, Vassal obtained the following results:

Mortality in 38 cases treated with serum, 8%.

Mortality in 80 cases not treated with serum, 30%.

To apply the serum therapy in a methodical way the blood should be examined once or twice daily for plague bacilli and to ascertain the leukocyte reaction. Noc, in New Caledonia, remarked that after each injection of serum there was a diminution of bacilli in the blood and an increase in the polynuclear leukocytes.

All the authors who have used antipest serum therapy insist on the importance of early intervention. The following table was drawn up by Yersin after his trial of serum therapy in Bombay in 1897:

Patients inoculated first day, mortality....12%
Patients inoculated second day, mortality..35%
Patients inoculated third day, mortality....50%
Patients inoculated fourth day, mortality..66%

The rule of antipest serum therapy may be expressed in a few words: act quickly and energetically. Quickly, that is to say, in the shortest possible time after the beginning of the disease. Energetically, that is to say, by intravenous and subcutaneous injections.

It is well to warn the patient that the serum sometimes produces skin eruptions, which are harmless. This precaution should be taken prior to the injection of antipest serum into healthy patients. During the quarantine of the "Senegal," such results of serum vaccination produced considerable anxiety among the passengers who had not been previously warned of the possibility of a skin eruption.

A GLANCE OVER THE DEVELOPMENT OF THE TECHNIC OF MODERN GYNECOLOGICAL OPERATIONS.*

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While glancing over the development of gynecology I became especially interested in finding out the various steps gynecological treatment has taken. Forty years ago the work of the gynecologist was

*Author's abstract of paper read before the American Genecological Society in Philadelphia.